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ECONOMIC INTELLIGENCE REPORT

SHIP COMPONENT PRODUCTION IN CZECHOSLOVAKIA

CIA/RR 16

9 December 1952

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CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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CIA/RR 16

(ORR Project 33-51)

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SHIP COMPONENT PRODUCTION IN CZECHOSLOVAKIA*

Summary and Conclusions

For many years the production of ship components has been a specialty of a large number of Czechoslovak plants. Although trade with the West has been sharply reduced, Czechoslovakia is still able to make occasional use of its competitive advantage in producing ship components to gain favorable terms in international trade.

Large, heavy forgings and castings for hull components and marine diesel engines and parts are major Czechoslovak contributions to foreign shipbuilding. Production of ship plate, armor plate, and marine optical and electrical equipment is also important.

Of significance to the Soviet Bloc economic and naval potential is the ability of Czechoslovakia to supply bottleneck items to Bloc shipbuilders. Construction of merchant ships in East Germany and Poland is aided by imports of critical parts for main and auxiliary engines.

The shipbuilding industry of the USSR is supported by shipments of marine propulsion units and armor plate. Soviet submarine construction is reported to be furthered by Czechoslovak shipments of periscopes, plate, and engine parts. There are indications that Czechoslovak production will give increasing support to shipbuilding activity in Poland and China. Production of several new types of marine diesel engines for the USSR may be expected in 1952-53.

Ship component production causes only a small drain on the material resources of Czechoslovakia except in years when large orders for ship plate are received. Consumption of electric power and transportation service is negligible. The industry is in part dependent on shipments of iron ore from the USSR and from Sweden. Flow of materials, parts, and finished components is subject to disruption by strategic bombing at Prague, Pilsen (Plzen), Moravska Ostrava, Bratislava, and Komarno.

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* This report contains information available to CIA as of 15 August 1952.

I. Introduction.

Ship components* may be placed in three general groupings. Some components are attached to or become a part of the bare hull. Other components are associated chiefly with the propulsion machinery. Still others are known as items of equipment and outfitting. Over 7,000 separate items are ordinarily installed aboard a medium-sized merchant ship. Production of these items takes place in plants belonging to almost every segment of the engineering industries, from rough foundry work to fine precision manufacturing. Thus the plants which produce ship components can not be considered to be discrete industries in which like products are produced.

1. General Description.

Czechoslovakia, with 418 kilometers of navigable inland waterways and no ocean ports, has only a very moderate need for shipbuilding. 1/** Five major shipyards are adequately equipped to maintain and replace units for the river fleet of approximately 600 vessels which conduct the river traffic of the country. 2/ (For a list of the principal shipyards in Czechoslovakia, see Appendix A.)

Immediately after World War II, Czechoslovak shipyards concentrated on rebuilding and repairing the river fleet, which the war had reduced to 348 operational units by 1945. In 1948, several yards undertook the building and repair of tugs and barges for Rumania and Bulgaria. 3/ Later the Old Skoda Shipyard at Komarno began to do repair work for Soviet ships. In 1950, construction of a limited number of garbage scows, barges, and river passenger boats for the USSR was begun. 4/

Czechoslovak shipyards on the whole are in good condition, modernized since the war, and the labor force possesses a high degree of skill. A new shipyard, with the best access from Czechoslovakia to the Black Sea and Soviet ports, has been constructed at Komarno at a cost of 200 million crowns. 5/ Despite this expansion, the industry will continue to employ less than 2 percent of the industrial labor force. 6/ The shipbuilding industry is expected to remain self-sufficient in its ability to obtain essential components from Czechoslovak plants. The shipbuilding industry is not an important factor in the economy of Czechoslovakia, but ship component production has greater economic significance.

* Ship component production is defined as manufacture of items which become part of the completed ship. Such production may take place either in special shops of the shipyards or in outside plants not necessarily associated with the shipbuilding industry. Ship plate and shipyard cranes are treated as ship components in this report.

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Czechoslovak ship component production has been an important contribution to world shipbuilding for many years, and the export of ship components has become an important method of helping to maintain a favorable balance of trade for Czechoslovakia. In the 1880's, Czechoslovak firms began to turn out forgings and castings for merchant ships. Later these firms played an important role in the construction of the Imperial Fleet of the Austro-Hungarian Empire. 7/

With the emergence of Czechoslovakia as one of the 10 leading industrial countries of the world after World War I, 8/ its factories continued to gain experience and reputation in the highly specialized techniques of producing ship components. (For a list of Czechoslovak plants of aid to shipbuilding, see Appendix B.) In the early 1930's the Skoda Works at Pilsen (Plzen) were selected to produce large structural pieces for the French liner Normandie. 9/ A few years later the same plant produced heavy castings for the Kirov, a Soviet heavy cruiser then being built in Leningrad. 10/ During World War II the German Navy further expanded production facilities in Czechoslovakia. Many of the factories emerged from World War II with little damage. In the immediate postwar period, several plants were able to resume production for shipyards in Western Europe and in Scandinavia.

2. Importance.

The importance of ship component production stems from the complex nature of modern shipbuilding methods. Except in unusual circumstances, most ships of 2,000 or more gross registered tons are individually designed units, fitted for a specific job and differing in many respects from other ships of the same general class. Because of special functions to be performed, or because of weight and space problems, ship components must also be specially designed and often are produced on a single-order basis. A major contribution by Czechoslovakia to world shipbuilding has been its ability to supply large, heavy forgings and castings to shipyards which do not have adequate foundry facilities or technological experience to turn out the intricate shapes and sizes needed for both hull and machinery components. Production of marine diesel engines, crankshafts, crankpins, and other engine parts is an additional factor of major importance. Production of alloy steels used in shipbuilding and adaptation of many general engineering products for use as marine equipment have been other Czechoslovak contributions to the shipbuilding industry.

The relative importance of ship components in the foreign trade of Czechoslovakia is illustrated by the fact that in the period 1947 through 1949, exports of marine engines and parts to the UK represented 30 percent

of the weight and 26 percent of the value* of all Czechoslovak exports of machinery to that country. 11/ Since the absorption of Czechoslovakia into the Soviet Bloc, Czechoslovak plants are known to have supplied ship components to Soviet and Satellite yards and can be expected to play an increasingly important role in support of Bloc shipbuilding.

In addition to filling a vital production gap in a strategically important industry, the ability of Czechoslovakia to produce ship components has been an element of strength in barter with the West for needed raw materials. 12/ In 1951, Czechoslovakia supplied marine shafts, piston rods, and forgings to a shipyard in Trieste, which in turn supplied propulsion units to Poland, a source of coal and ore for Czechoslovakia. 13/ Recently Czechoslovakia has refused to permit visits by marine insurance inspectors from Western countries to the plants producing the components. 14/ Because marine insurance companies usually require such inspection before insuring a ship, this act has reduced the importance of trade in ship components, but some commerce still continues. On 15 January 1952, for example, an agreement was concluded whereby Norway agreed to export 500 metric tons of aluminum in exchange for 400 metric tons of ship plate and 100 metric tons of marine boiler parts and shipbuilding material. 15/

Czechoslovakia, a nation whose economy is greatly dependent on foreign countries for basic raw materials, has developed a highly diversified engineering industry as a means of earning foreign currency. 16/ The export of ship components has become an important method of helping to maintain a favorable balance of trade.

3. Organization.

The engineering industries of Czechoslovakia have been formed into a highly centralized organization, monolithic in structure, with over-all planning directed on high government levels. Each industrial plant is placed under the administrative authority of a national corporation according to the character of its products. The national corporation in turn falls within the jurisdiction of the Principal Administration of one of the industrial Ministries. Czechoslovak Ministries under which ship component production is carried on are the Ministry of Heavy Engineering, the Ministry of General Engineering, and the Ministry of Light Industry. These Ministries are supervised by the Economic Section of the Council of Ministers. 17/ The Ministry of Defense may exercise direct control on individual plant shops whose output is considered to be of interest to the national security of Czechoslovakia.

* Exports of machinery from Czechoslovakia to the UK in 1947, 1948, and 1949 totaled an estimated value of $1,650,953. Of this total, $423,705 were in marine engines and parts.

Representatives of Soviet military and commercial missions have liaison with Czechoslovak authorities at top levels of administration and planning. In specific plant shops, where production is of particular concern to the USSR, Soviet technical supervisors may also exercise a close watch on manufacturing processes. 18/ Further Soviet control measures are effected by rigid acceptance testing by Soviet personnel.

In some plants, multiple channels of control will be found. The Lenin Works, formerly Skoda Pilsen, which is a plant falling under the Principal Administration for Skoda of the Ministry of Heavy Engineering, has some of its shops supervised by representatives of the Soviet missions, 19/ others by representatives of the Ministry of Defense, and the remaining shops are supervised through the usual control channels of the Ministry of Heavy Engineering.

The accompanying chart* shows governmental controls on certain plants engaged in the production of ship components and in related activities. Under each plant is a list of products, and the plant itself is placed in the framework of the Czechoslovak industrial organization as it existed in January 1952. 20/

For clarity in illustration, the lines showing extraordinary controls are drawn only to the Lenin Works. Such controls may also exist in individual shops of any of the other firms. The chart also shows the several export companies which transact foreign trade in ship components. The illustrated administrative structure of the Ministry of Foreign Trade takes into account the changes made in the reorganization of 1 January 1951. 21/

Since the Communist seizure of power, the entire Czechoslovak engineering industry has undergone several major organizational changes as the government has tightened its control on the national economy. Further changes can be expected. 22/

4. Technology.

Technical ability, a skilled labor force, modern production equipment, and chauvinistic pride in local craftsmanship help the Czechoslovakians keep abreast of latest developments in production and design. Although little information on new production techniques is available, heavy structural castings are known to be made in accordance with sound design. A photograph**

* Following p. 6.
** Following p. 6.

shows a spectacle-frame type of propeller strut manufactured at one of the foundries of the Vitkovice Iron Works near Moravska Ostrava. 23/ The differences in the thickness of the metal in the casting require great care in the casting process to avoid uneven cooling. US foundries usually avoid the technical difficulties inherent in such work by making two separate sectional castings which are installed on either side of the hull and reinforced after installation on the ship. In the illustrated Czechoslovak strut, a single casting with an integrated structural support unit of floors and diaphragms may be seen in the trapezoidal center section. The central portion gives good continuity of support to the entire unit. Although this type of reinforced casting is sometimes installed in ships built in the US, it is not in common use and is structurally superior to similar-purpose brackets currently being designed for many ships being built in US yards.

II. Production of Ship Components.

1. Location.

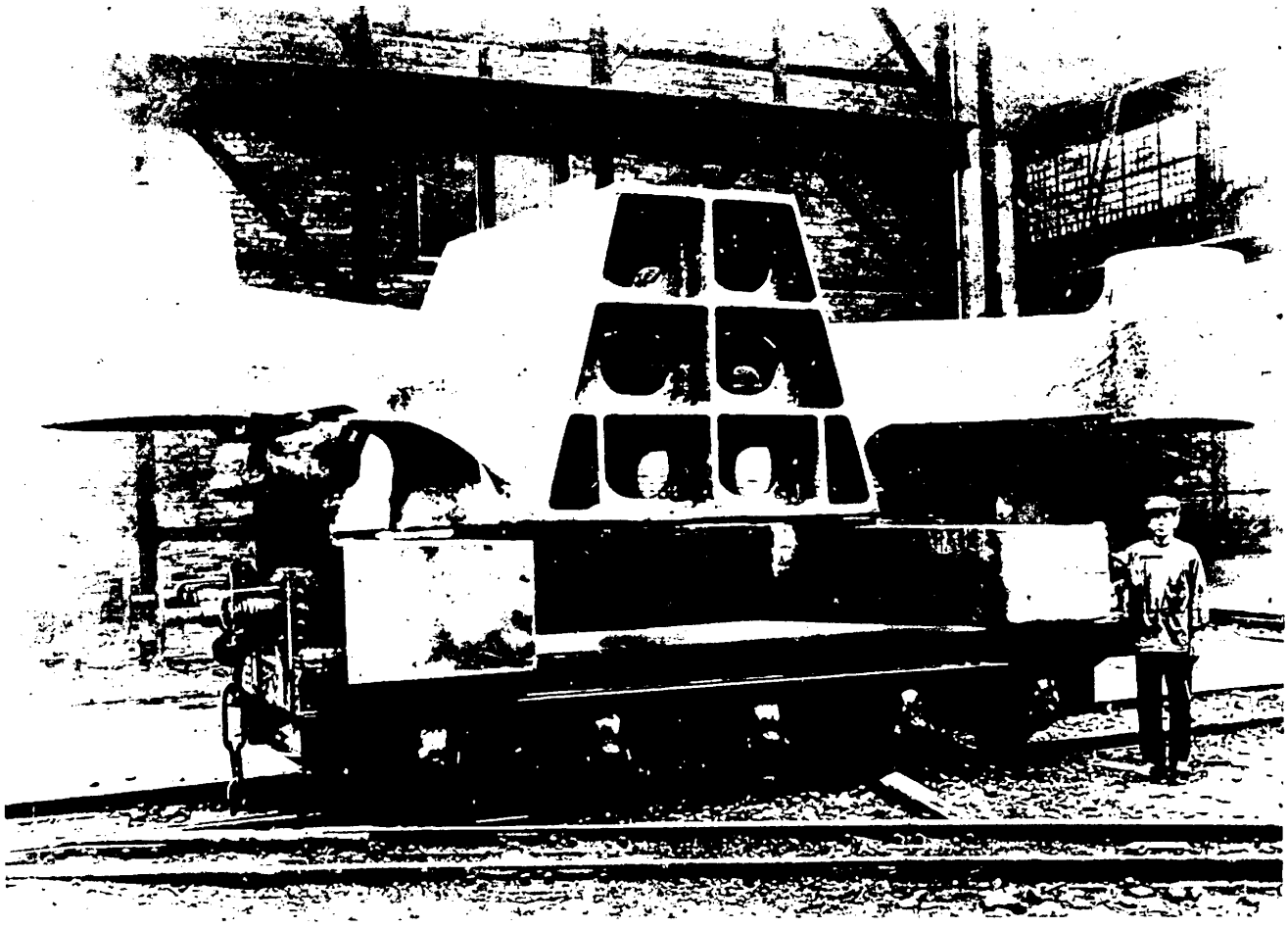
The majority of Czechoslovak plants producing ship components are located in the former province of Bohemia. A circle with a 50-mile radius centered at Prague would include many of the important factories. Most of the remaining plants of significance are located in the north-central section of Old Moravia. The announced program of transferring industry to the eastern part of the country (Slovakia) has as yet had little discernible effect on the production of ship components. This region has few plants known to have been producing ship components in 1951.

The accompanying map* pinpoints the geographic location of the component plants and also shows the shipbuilding yards and navigable waterways. 24/ The only towns shown are those known to contain at least one factory used in production or processing of parts used in or for shipbuilding. (For an alphabetical listing of these towns with factory and product data, see Appendix B.)

2. Capacity.

The exact capacity of Czechoslovak plants to produce ship components is difficult to assess because of the special-order nature of production. No factory is known to be devoting full time to ship component production. Yearly capacity can, however, be approximated on the

* Following p. 35.



Marine Propeller Strut (Weighing 42,000 Kilograms)
Manufactured at the Vitkovice Iron Works near Moravska Ostrava.

ADMINISTRATIVE CONTROLS ON SELECTED SHIP COMPONENT PLANTS AND RELATED ACTIVITIES IN CZECHOSLOVAKIA (TENTATIVE) January 1952

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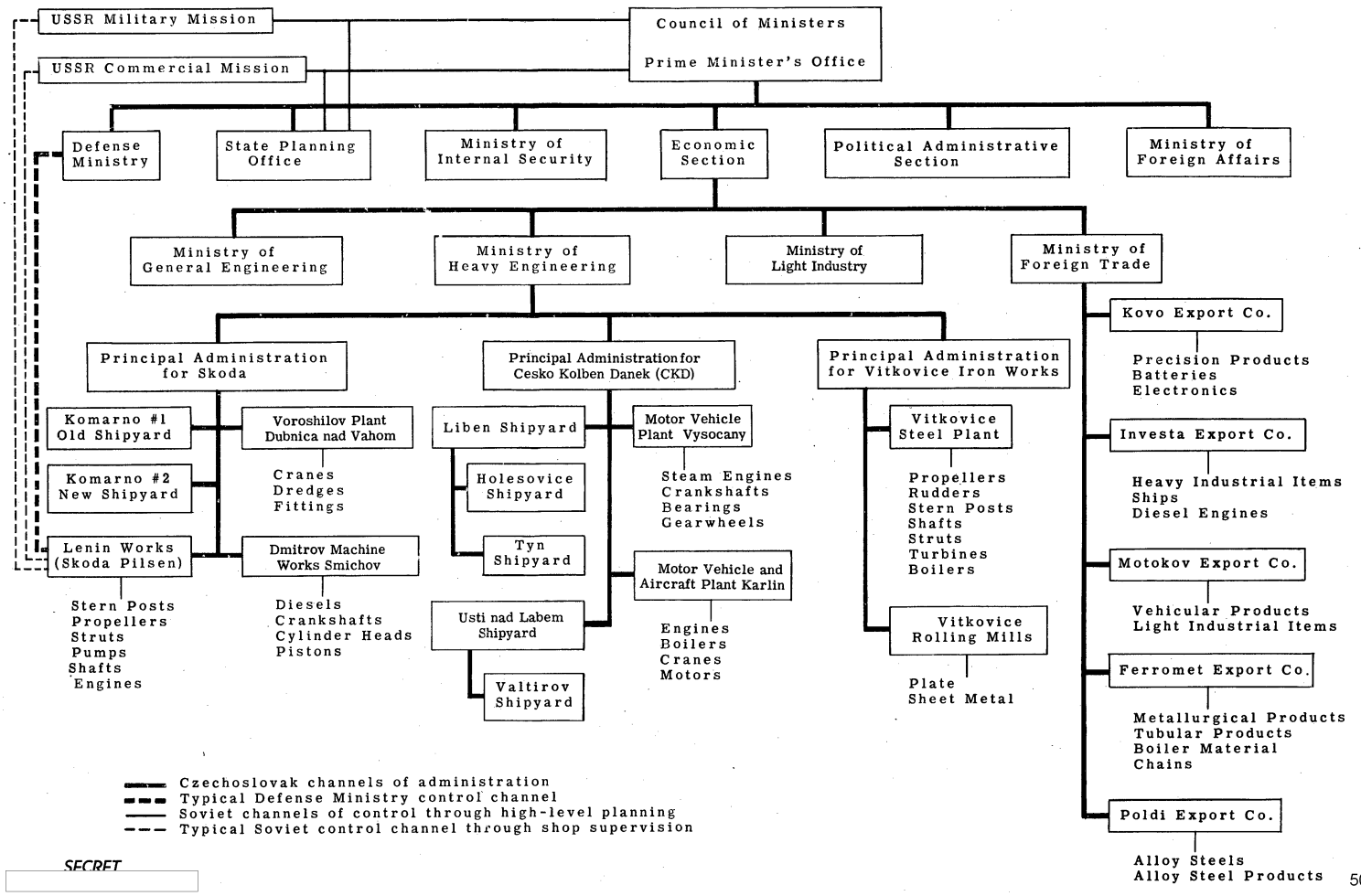

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assumption of full-time devotion of facilities to production of ship components. Actual yearly output will of course be less than capacity figures.

Foundries in Czechoslovakia are capable of producing over 80,000 metric tons of heavy forgings and castings yearly. 25/ Productive potential for ship plate is believed to be 165,000 metric tons and for armor plate 84,000 metric tons. 26/ Annual capacity for production of diesel engines is believed to be over 15,000 units of less than 100 horsepower and a smaller number of units of more than 100 horsepower. 27/ Information on production of marine optical gear and electronic and shipyard equipment is insufficient to assess productive capabilities.

3. Output.

It should be noted that actual output of ship plate, marine forgings and castings, and marine diesel engines usually would be substantially less than the capacity figures given above, because such production would result in undue displacement of other activities of equal or greater priority.

a. Large Hull Components and Heavy Equipment.

Heavy forgings and castings for shipbuilding are produced at the foundries of three major plants: the Lenin Works in Pilsen, the Vitkovice Iron Works with several plants in the Vitkovice-Moravska Ostrava region, and the United Steel Works at Kladno. Production at Pilsen and in the Ostrava region includes finished or semifinished parts for rudder posts, rudders, stern posts, keel sections, propeller shafts, propeller struts, anchors, marine engine crankshafts, chain, and armatures. The United Steel Works at Kladno specializes in forgings and castings made of alloy steel. In 1948 the Old Steel Works at Vitkovice turned out heavy castings for six ships building in Western Europe and Scandinavia. These castings ranged in size from 6 to 46 metric tons. 28/

Anchors and chain are important products of Czechoslovak foundries. One order, in 1949, included 221 metric tons of forged chain and anchors. 29/

b. Plate and Profiles.

Ship plate and structural pieces for consumption in Czechoslovak shipyards are produced at the Sverma Steel Plant of the Central Slovak Iron Works at Podbrezova. Additional steel for domestic use is provided by

several other plants whose primary significance is in the production of ship plate for export. These plants include the rolling mills of the Lenin Works in Pilsen and the Molotov Steel Plant in Trinec. The Lenin Works is reported to have produced 55 armor plates for submarines in the second quarter of 1951. 30/ The Vitkovice Rolling Mills (of the Vitkovice Iron Works) are important producers of ship and armor plate. 31/ In 1949, these mills are reported to have produced 70,000 metric tons of armor plate for one export order. 32/

c. Propulsion Units.

The Dmitrov Machine Works in Prague-Smichov is the major Czechoslovak producer of marine diesel engines. 33/ Other Skoda plants at Dubnica nad Vahom and Povazska Bystrica 34/ and the Avia Works at Kunovice 35/ are reported also to be producing marine diesel engines on Skoda patents. One series of Skoda marine diesel engines has the characteristics shown in Table 1.

Table 1

Characteristics of the Skoda Marine Diesel Engine L160 with 160-Millimeter Bore 36/

Model a/	Cylinders	Horsepower at 1,000 Revolutions per Minute	Horsepower at 750 Revolutions per Minute
2L160	2	Not Applicable	45.0
3L160	3	90	67.5
4L160	4	120	90.0
6L160	6	180	135.0
8L160	8	240	180.0

a. The first number corresponds to number of cylinders; the letter "L" indicates marine diesel; the last three digits are diameter of bore in millimeters.

Nation-wide data on current annual output of the above engines has not become available. [redacted] 50X1
[redacted] 1951 production at the Dmitrov Machine Works and at several 50X1
plants associated with it in diesel production in or near Prague. These plants include the Walter Engine Works in Prague-Jinonice, the Plants I and II in Horovice, and a factory in Kolin. Production of marine diesel engines in the Prague area in 1951 (see Table 2) represented 11 percent of the total diesel engine production in these plants for that year.

Table 2

Production of Marine Diesel Engines in Plants of the Prague Area 37/
1951

Type a/	Revolutions per Minute	Horsepower	Kilograms per Horsepower	Weight without Flywheel (Kilograms)	Kind of Production	Number Produced
6L275	550	430	21.8	9,400	Series	240
8L275	500	520	24.0	12,500	Rebuilt	8
6L350	300	520	41.7	21,700	Series	16

a. The first number corresponds to number of cylinders; the letter "L" indicates marine diesel; the last three digits are diameter of bore in millimeters.

Marine adaptations of two stationary types of diesel engines were also produced in Prague in 1951 at the Dmitrov Machine Works. Production plans for the year were for 10 units of Model S350 (stationary). Actual production during 1951 of one stationary engine daily, Model 4S250, has been reported. This figure appears to be high, but assuming that no more than 120 units of this engine were turned out during the year, combined production of marine diesel engines (see Table 1) and marine-adapted diesel engines would represent 16 percent of all production of diesel engines in the Prague area in 1951. 38/

[redacted] the Dmitrov 50X1
Machine Works produced 60 submarine diesel engines in the second half of 1951. 39/ Skoda sales material shows that several high-speed diesel

engines which would be suitable for this use have been produced in the past. [redacted] only two units with sufficient horsepower for submarine propulsion were produced in 1951. Development of two new high-speed, light-weight diesel engines and granting of a Soviet license to manufacture a third were reported. All three models are of interest for possible use in submarines. 40/ 50X1

In addition to diesel engines, production of other types of marine propulsion units is reported. The Electric Motor Works at Moravska Ostrava was expected to complete an annual order in 1951 for delivery of 92 "Bubnoff" gasoline-powered speedboat engines developing 900 horsepower. 41/ The Gottwaldov Zavod in Brno was reported to be producing 100-horsepower steam engines for small ships in 1950. 42/

Production of diesel and steam engines of 2,000 horsepower and less for tugs built in domestic shipyards and for export is done on a special-order basis at the Lenin Works in Pilsen, at the Dmitrov Machine Works in Prague-Smichov, and at the Motor Vehicle and Aircraft Plant, under the administration of Cesko Kolben Danek (CKD), in Prague-Karlin. 43/ In 1949, Skoda Pilsen is reported to have produced 3,500 metric tons of castings for marine engines for one foreign firm. 44/ Production of engine parts including crankshafts, crankpins, and pistons for foreign and domestic yards is reported at several additional plants.

d. Yard Equipment.

The Skoda plant at Dubnica nad Vahom produces two types of yard and harbor cranes with a load capacity of 5 and 10 metric tons. Parts are supplied by the Lenin Works and by the Vitkovice Iron Works. Production of two cranes per month is estimated from mid-1950 to mid-1951. 45/ Among other shipbuilding production equipment known to have been produced in 1951 were forging presses of 2,500 and 4,000 metric tons, probably produced at the Lenin Works. 46/

e. Submarine Components.

During World War II, several Czechoslovak plants contributed to the German submarine construction program. [redacted] renewed interest in productive potential at some factories. The plants of interest on the basis of reported past, present, or potential contributions to submarine construction are listed in Table 3.* 50X1

* Table 3 follows on p. 11.

Table 3

Czechoslovak Plants of Possible Aid to Submarine Construction

Town	Plant	Product	Remarks
Nova Paka	Tesla Instrument Works	Precision instruments	World War II Production 47/
Novy Bor	Skoda Instrument Works	Precision instruments	World War II Production 48/
Pilsen	Lenin Works	Propellers and shafts	World War II Production 49/
Prague-Kosire	Stys Optical Works	Periscopes	World War II Production 50/
Vitkovice	Vitkovice Steel Plant	Propellers, castings, diesel engine crankshafts	World War II Production, 1949, to USSR 51/
Hradec Kralove	Krystal	Radio sets for submarines	Five per week, Dec 1948 52/
Janov	Optik	Periscope lenses	Sent to Rynovice, 1950 53/
Prerov	Optitechna	Parts for periscopes	Sent to USSR, 1949 54/
Radotin	Asta Battery Plant	Batteries	Suitable for Submarines, 1950 55/
Rynovice	Elektro-Praga (Former Zeiss Plant)	Periscopes	World War II Production; 10 per month reported in early 1950 and Dec 1951 56/
Prague-Smichov	Dmitrov Machine Works	Diesel engines	Reported sent to USSR, 1951; important potential for submarine diesel production 57/
Chomutov	Gustav Klement Works	Compressed air containers	Under USSR supervision, 1950, 1951, 1952 58/

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III. Input Requirements.

1. Materials.

The principal materials used in ship component manufacture are steel and cast iron. Among nonferrous metals consumed in smaller quantities are copper, bronze, tungsten, aluminum, molybdenum, nickel, and chromium.

Absence of good evidence on total current yearly production makes reliable computations of inputs impossible. It is felt, however, that a useful statement as to the relative significance of the industry as a consumer of raw materials can be made. By taking, for example, known maximum production of 1 month (chiefly from trade statistics) and multiplying by 12, an exaggerated annual figure is obtained because it is known that all months do not reach the maximum production of the month used. Using the exaggerated annual figure, however, the drain on material availabilities is determined to be small except when large orders for ship plate or armor plate are produced.

Steel requirements for six heavy structural castings produced at the Vitkovice Iron Works in 1948 averaged 31 short tons per unit. 59/ Assuming a maximum national production of 50 large castings yearly, requirements for raw steel would not exceed 1,395 metric tons yearly. Available evidence on other marine forgings and castings, including anchors, chains, and crankshafts, does not indicate that production would exceed 4,500 metric tons of finished units yearly. Production at this level would consume 6,210 metric tons of raw steel. Total requirements for forgings and castings, then, would not exceed 7,605 metric tons of raw steel yearly.

Production of marine diesel engines is known to consume the amounts of steel per unit shown in Table 4.* 60/

* Table 4 follows on p. 13.

Table 4

Steel Requirements of Various Sizes of the Skoda Marine Diesel Engine L160 with 160-Millimeter Bore 61/

Model Number a/	Metric Tons: Finished Steel	Metric Tons: Raw Steel
Skoda 2L160	1.8	2.5
Skoda 3L160	2.0	2.8
Skoda 4L160	2.4	3.3
Skoda 6L160	2.9	4.2
Skoda 8L160	3.7	5.1

a. The first number corresponds to number of cylinders; the letter "L" indicates marine diesel; the last three digits are diameter of bore in millimeters.

[redacted] outside limits to actual annual production of marine engines can be set at 400 larger units and 3,500 engines of 90 horsepower or less. Such production would require 3,513 metric tons of raw steel for larger models and 8,750 metric tons of raw steel for smaller units, or an annual total of 12,263 metric tons of raw steel. 50X1

Plate production accounts for the largest consumption of raw steel. In 1949, 98,000 metric tons of material were reported to have been allotted for production of armor plate for export at the Vitkovice Rolling Mills. 62/ This allocation is believed to have included some 4,500 metric tons of nickel, 1,500 metric tons of chrome, and 250 metric tons of molybdenum. The allocation is the largest reported and is believed to be the maximum annual allotment probable for production of this commodity.

The only other significant consumption of raw materials stems from the production or yard and harbor cranes. Production of 26 cranes yearly as reported in 1950-51 is believed to have consumed some 450 metric tons of raw steel and 36 metric tons of concrete.

Despite the absence of reliable data on actual production, it can be readily seen that unless a considerable quantity of ship plate

were produced for export, production of ship components would consume a fairly small amount of material in any one year. Raw steel requirements for domestic Czechoslovak shipbuilding are reported to be only 3,000 metric tons per year. 63/

Total annual raw steel requirements, then, would appear to be slightly more than 23,000 metric tons except in years when substantial export orders for plate are received. In such years, up to 92,000 additional metric tons of raw steel, 4,500 metric tons of nickel, 1,500 metric tons of chrome, and 250 metric tons of molybdenum might be used.

2. Manpower.

The number of personnel working on the manufacture of ship components is included statistically in the labor force of the Czechoslovak Ministry having jurisdiction over the particular kind of work, such as the Ministry of Light Industry and the Ministry of Heavy Engineering. Because almost all personnel involved devote only part-time attention to component manufacture, segregation of man-hours for this activity is hazardous. An estimate based on the ratio of workers to steel consumed in similar work in East Germany indicates that approximately 8,000 men are employed yearly in production of ship components in Czechoslovakia under conditions of maximum production. 64/

3. Electric Power.

Electric power is used in most of Czechoslovak plants producing ship components. Total consumption, however, is a negligible drain on the power available in the country.

The production and processing of ship components for domestic and foreign consumption is estimated to require some 22 million kilowatt-hours (kwh) yearly. This figure excludes power required in the manufacture of ship plate. The production and rolling of plate, if continued at the rate reported in 1949, would require an additional 29,040,000 kwh. The total of 51,040,000 kwh, which represents a maximum, would amount to 0.5 percent of the power produced in Czechoslovakia in 1951. 65/

4. Transportation.

Marine diesel engines produced in the Prague area are shipped by rail to Mukachevo in the Ukraine. 66/ The shipment of some 400 engines in 1951 required 1.2 million ton-miles of rail transport. Other shipments

required a maximum additional 4.8 million ton-miles, or a total of 6 million ton-miles. This figure represents less than 0.004 percent of the rail service available in 1951.

IV. Distribution.

1. Domestic Requirements.

Czechoslovak firms are believed to be capable of filling orders for all components required by domestic shipyards. The shipyards at Komarno rely chiefly on the Lenin Works in Pilsen and the Dmitrov Machine Works in Prague-Smichov for engines and machinery. The Liben, Strekov, and Valtirov shipyards obtain much of their machinery from the CKD plants in Vysocany and Karlin. 67/ The pattern of distribution to domestic yards is not rigid, however, and the CKD shipbuilding yards use Skoda marine diesel engines, and the Skoda yards in Komarno receive supplies from non-Skoda firms, including the Sverma Steel Plant in Podbrezova and the United Steel Works in Kladno. The Vitkovice Iron Works helps to supply steel plate and structures to all building yards in Czechoslovakia. In general, procurement of components seems to be based on availability rather than on inflexible channels of supply.

2. Exports.

Before World War II, Czechoslovakia had a good market for ship components in Balkan shipyards and in Western Europe. Components for both merchant and naval vessels were occasionally supplied to the USSR. After the war, Czechoslovakia again entered the Western European market and in 1948 was supplying components to firms in Great Britain, Switzerland, France, the Netherlands, Sweden, Norway, and Italy. 68/ Shipments to the West have since tapered off, and only two areas, Norway and Trieste, are known to be receiving any significant shipments from Czechoslovakia. In 1946, 75 percent of all Czechoslovak diesel engines were exported to Western countries. 69/ It can therefore be assumed that substantial manufacturing capacity has been released which could be utilized for production of components for the USSR.

In 1949 and 1950, East German shipyards received limited numbers of Skoda marine diesel engines and engine parts, including pistons and crankshafts. More recently, turbine blades, crankpins, shafts, plate, and ingots have been sent to that country in small quantities on special

orders. Soviet ships, including the Kaliningrad 70/ and the Mozhaysky, undergoing reconstruction in East German shipyards, are being fitted with auxiliary engines, generators, and parts supplied by Skoda within 4 months of receipt of purchase orders. 71/

Polish shipyards are the main recipients of the small steam engines produced at Brno. Other shipments to Poland include propellers, shafts, and plate. 72/ In 1951 the harbor and shipyards at Stettin were fitted with cranes made in Czechoslovakia. 73/ Because of present Polish limitations in component production, increased shipments of Czechoslovak components can be expected. There are indications that Polish shipbuilding officials are becoming interested in closer coordination with Czechoslovakia as a means of relieving the severe machinery and material bottlenecks which plague their industry. 74/

It was recently reported that a Polish shipping company has contracted to deliver 3,500 Czechoslovak internal combustion engines to Communist China in 1952, 75/ but these engines are not specified to be marine diesels. The Chinese engineering industry is believed to require a small number of engines annually. In view of a recent estimate of 3,000 engines required to render small motor junks and landing craft operational, and widespread efforts by the Chinese to procure marine diesel engines, it seems likely that at least some of these engines are marine diesels intended for Chinese shipyards. 76/

An important outlet for Czechoslovak ship components is the USSR. Reported shipments in 1951 amounted to almost 400 marine diesel engines, 92 gasoline-powered speedboat engines, and 58 high-speed diesel engines suitable for marine usage. Fifty-five special armor plates for submarines were reported to have been shipped 77/ to the USSR in the second quarter of 1951. 78/ Recent shipments of armor plate are, however, believed to be substantially less than the 70,000 metric tons reported shipped in 1949. The submarine components listed in Table 3 are shipped to the USSR. Shipments reported in 1951 include periscopes and pressure tanks. Shipments of unknown numbers of propellers and light marine equipment are believed to be continuing. 79/ Production for the USSR of fittings and parts for 2,000 rubber dinghies and 2,500 life jackets was reported in 1950. 80/

3. Stockpiling.

Because ship components are usually produced for specific export orders, extensive stockpiling in Czechoslovakia is unlikely. There are some indications, however, that series production of marine diesel engines at the Dmitrov Machine Works in Prague-Smichov occasionally results in

small surpluses of certain models. These units probably are stored for brief periods in plant warehouses until export orders arrive.

V. Limitations, Vulnerabilities, and Intentions.

1. Limitations.

The supply of skilled labor, production equipment, and semi-processed materials in Czechoslovakia is believed to be adequate to meet demands for production of ship components.

Czechoslovak industry is limited generally by shortages of iron ores and some nonferrous metals. Supplies of domestic iron ores are being augmented by shipments from the USSR. Swedish ores of high grade are also used. In 1951, 750,000 metric tons of iron ore were imported from Sweden. 81/ In 1952, 500 metric tons of raw aluminum were to be imported from Norway. 82/

2. Vulnerabilities.

Western orders were the governing factor in developing Czechoslovak production of ship components. Current Western trade policies restrict the exchange of goods and services with Czechoslovakia. As a result, many Czechoslovak firms have found themselves cut off from their normal markets. 83/

The flow of materials and parts and the transport of finished ship components pass through the railroad marshalling yards at Prague, Pilsen, and Moravska Ostrava, the key transportation centers. River traffic is centered at Prague on the Vltava River and at Bratislava and Komarno on the Danube.

3. Intentions.

There are indications that production of ship components in Czechoslovakia is being geared to meet the needs of Bloc countries. Czechoslovak concerns have had an active market in the river shipyards of Rumania, Hungary, and Bulgaria for many years. With shipbuilding activity in these countries greatly intensified in recent years, 84/ this market may be expected to expand.

In 1946 the Eastern countries as a group received only 25 percent of Czechoslovak exports of diesels. 85/ In 1951 the USSR was the most important recipient of marine diesel engines. Continued and increasing

interest by the USSR is indicated by the granting of licenses to manufacture Soviet-designed engines at the Dmitrov Machine Works in Prague-Smichov late in 1951. 86/

Czechoslovakia is also seeking outlets in India 87/ for its diesel engines and is also believed to have entered the Chinese market in 1952. 88/ Poland is expected to become an increasingly important outlet for marine diesel engines, steam engines, ship plate, and boilers. 89/

Shipment of substantial quantities of ship plate and ship boiler parts to Finland in support of the Finnish program of building ships for the USSR may also be expected. Orders were placed in 1952 under trilateral agreements between Czechoslovakia, Finland, and the USSR. 90/

APPENDIX A

PRINCIPAL SHIPYARDS IN CZECHOSLOVAKIA

Location	Yard	Remarks
Bratislava	Former Samler Yard	Large repair yard, limited new construction of barges and boats. Probable second yard, for repairs only, located in Winter Harbor. 91/
Decin	Josef Sedivy	Small yard for repairs to barges; possibly dismantled late in 1951. 92/
Holesovice	Former Antropius Yard	Barge construction and repair; subordinate to Liben shipyard. 93/
Hradec Kralove	Skoda Foundry	Metal-processing plant with one assembly hall for pontoons and welded barges; four motor barges built for Volga-Don Canal, early 1952; poor access to navigable water. 94/
Komarno	Old Skoda Shipyard	Important yard for repairs to Danube River fleet and Soviet river craft; equipped also for new construction. 95/
Komarno	New Skoda Shipyard	Large, well-equipped yard for new construction of tugs, barges, and passenger vessels; four motor barges and two passenger vessels built for Volga-Don Canal, early 1952. 96/
Kresice	Kresice	2.4 million crowns investment planned 1949-53. 97/
Liben	CKD	Large yard, builds tugs, barges, scows, and passenger vessels; four motor barges built for Volga-Don Canal, early 1952. 98/

PRINCIPAL SHIPYARDS IN CZECHOSLOVAKIA
(Continued)

Location	Yard	Remarks
Strekov	CKD	Subordinate to Usti nad Labem Yard; construction and repair of barges. 99/
Tyn	Jan Sileny	Minor yard, building and repair of wooden barges. 100/
Usti nad Labem	CKD	New construction and repair of tugs and barges; four motor barges built for Volga-Don Canal, early 1952. 101/
Valtirov	CKD	Subordinate to Usti nad Labem Yard; builds and repairs barges and dredges. 102/

APPENDIX B

CZECHOSLOVAK PLANTS OF AID TO SHIPBUILDING a/

City	Plant	Product or Activity
Bratislava	Kablo	Marine cable, exported to the USSR, 1951. 103/
Brno	Gottwaldov Zavod	Marine crankshafts, steam engines, gas turbine design work, turbines, compressors, pumps, steel plate. 104/
Brno	J.F. Cernil Co.	Kayaks, wood, duralumin, three models. 105/
Chomutov	Gustav Klement Works (Former Mannesman Works)	Compressed air containers for submarines, 1949, 1950, 1951, 1952. Mine throwers for naval craft from 1 Jul 1951. 106/
Dubnica nad Vahom	Voroshilov (Skoda)	Cranes, dredges, fittings, parts, marine diesel engines. 107/
Hloubetin	Elektra	Electronic tubes for naval communications. 108/
Horovice	Plants I, II	Marine diesel engines. 109/
Hradec Kralove	Krystal	Radio transmitters and receivers for submarines; five units per week in Dec 1948. 110/
Hradec Kralove	Skoda	Marine engines, couplings, pontoons, welded steel barges. 111/
Janov nad Nisou	Optik	Lenses for periscopes. 112/
Jinonice	Walter Engine Plant	Marine diesel engines. 113/
Karlin	Motor Vehicle and Aircraft Plant, CKD	Engines, boilers, turbines. 114/

a. Plants of priority intelligence interest are designated by an asterisk. Additions and corrections are invited.

CZECHOSLOVAK PLANTS OF AID TO SHIPBUILDING
(Continued)

City	Plant	Product or Activity
Kladno	United Steel Works*	Alloy steels, marine crankshafts, turbine blades, forgings and castings from alloy steel. 115/
Kladno	Konev Foundries	Armor plate. 116/
Kolin	Dmitrov Machine Works Branch Plant	Marine diesel engine parts. 117/
Kosire	F. Lombersky Co.	Lomberit artificial resin for facing ships' cabins. 118/
Kosire	Skoda	Automatic computers for naval fire control. 119/
Kosire	Stys Optical Works	Optical equipment, lenses, prisms, periscopes. 120/
Kraluv Dvur	Prague Industrial Co.	Marine propeller shafts exported to USSR, Poland, and Turkey. 121/
Kunovice	Avia Works	Marine diesel engines. 122/
Levice	Boiler Plant	Boilers. 123/
Liben	Sokolovo	Ship propellers for USSR, Oct 1951. 124/
Moravska Ostrava	Electric Motor Works	Gasoline speedboat engines. 125/
Myjava	Povazske Strojarne	Brass armatures, brass valves for rubber boats, life jackets. 126/
Napajedla	Fatra Rubber Products Co.	Rubber life jackets, rubber dinghies. 127/
Nova Paka	Tesla Instrument Works	World War II production of submarine production instruments. 128/
Novy Bor	Skoda Instrument Works	World War II production of submarine precision instruments. 129/
Pardubice	Telegraphia	Naval communication and electronic equipment. 130/

CZECHOSLOVAK PLANTS OF AID TO SHIPBUILDING
(Continued)

City	Plant	Product or Activity
Pilsen	Lenin Works*	Steel plate, forgings and castings for rudder posts, rudders, stern posts, keel sections, propeller shafts, propeller struts, propellers, anchors, chain, marine engine crankshafts, engine blocks, compressors, turbines, boilers, armatures. 131/
Podbrezova	Sverma Steel Plate	Plate, frames, longitudinal sections to Komarno shipyards. 132/
Povazska Bystrica	Skoda	Marine diesel engines. 133/
Plotiste nad Labem	Skoda	Small marine propellers. 134/
Prague (See Hloubetin, Jinonice, Karlin, Kosire, Smichov, Stare Strasnice, and Vysocany)		
Prerov	Optitechna	Periscopes, unassembled parts for periscopes. 135/
Prlov	Telefunken	Radio receivers. 136/
Radotin	Asta Battery Plant	Batteries suitable for submarine use. 137/
Rynovice	Elektro Praga*	Submarine periscopes; 10 per month to USSR. 138/
Smichov	Dmitrov Machine Works*	Principal producer of marine diesel engines. 139/
Stare Strasnice	CKD Strasnice	Boilers, cranes. 140/
Trinec	Molotov Steel Plant	Ship plate including special plate for submarines. 141/

CZECHOSLOVAK PLANTS OF AID TO SHIPBUILDING
(Continued)

City	Plant	Product or Activity
Vitkovice	Vitkovice Steel Plant*	Ships' boilers and parts, ship plate, armor plate, pipes, tubing, castings and forgings for rudder posts, rudders, stern posts, keel sections, propeller shafts, propeller struts, propellers, submarine diesel engine crankshafts, turbines, armatures. 142/
Vitkovice	Vitkovice Rolling Mills	Ship plate, armor plate, sheet metal. 143/
Vysocany	CKD Electrical Equipment Plant	Material processing for marine crankshafts, axle bearings, cogwheels. 144/

APPENDIX D

METHODOLOGY

50X1

50X1

The special-order nature of production, part-time activity factors, and lack of detailed yearly production figures did not permit a reliable estimate to be made on the actual annual output of most ship components.

Because input data on individual ship components were available, outside limits to total material requirements were set by multiplying input factors by maximum short-term production, arbitrarily extended over a year. The resultant exaggerated figures show the relative insignificance of ship component production as a material consumer except under stated conditions. These figures are not necessarily reflective of actual production.

In every case where production of specific items was mentioned, the factory capability to produce them was considered. The more important plants and the more reliable product data are mentioned in the body of the report. Some of this information is repeated in the listing of plants in Appendix B along with lists of other production and activity of lesser or unverifiable reliability.

Electric power requirements were computed on the basis of 1,100 kwh required per metric ton of steel for machinery production and 242 kwh per metric ton of steel for production and rolling of plate.

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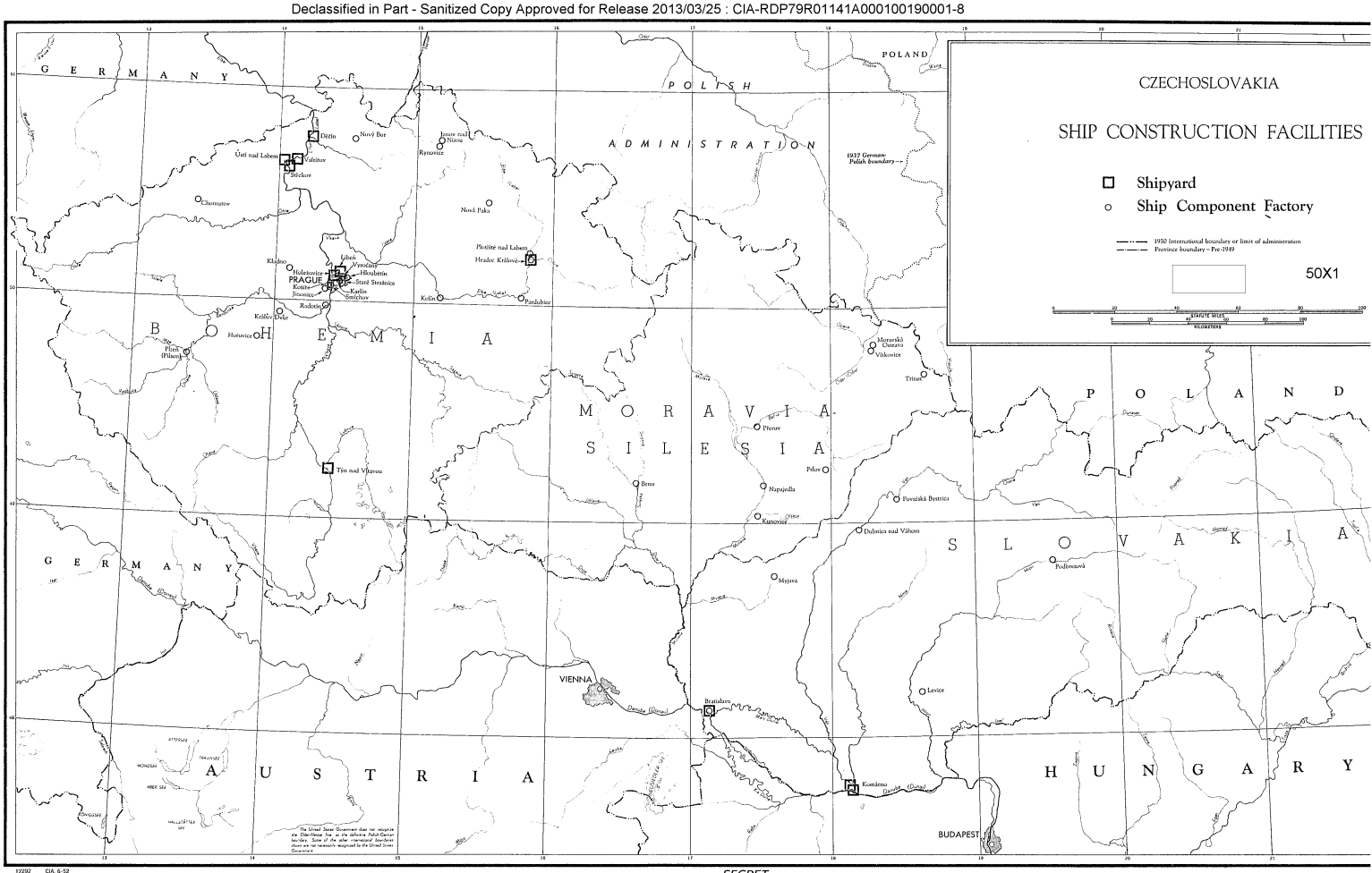

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